

## CASE REPORT

# A six-canal maxillary first molar: case report

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### Abstract

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**Aim** The aim of this case report is to describe an unusual six-canal maxillary first molar tooth.

**Case report** The maxillary left first molar of a young African-American male was treated as an emergency at the first visit. At the second visit, the five canals (MB1 and 2, Pal1 and 2 and DB) were easily identified at high magnification of 16–25 $\times$  under an operating microscope. The canals were then instrumented and filled using the Microseal<sup>TM</sup> technique. A careful radiographic examination of the final fill indicated that there was a third canal in the palatal root as suggested by a slight extrusion of the filling material between the two canals. At the third visit, the fillings of the palatal canals were removed and the apical 4 mm was re-examined. The existence of a third palatal canal exiting between the two apices was verified and subsequently instrumented and obturated.

### Key learning points

- It should be assumed that all molar teeth have more than the traditionally expected three canals.
- The location of root canals should be identified at high magnification under the microscope.
- Careful radiographic re-examination of the fillings should be done in order to identify possibly missed canals.

**Keywords:** maxillary first molar, root canal anatomy.

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### Introduction

The goal of root canal treatment is to clean the root canal system as thoroughly as possible and to fill it in all its dimensions (Cohen & Burns 1998). In depth knowledge of the root canal anatomy of each tooth is crucial in order to reach this goal.

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**Table 1** Reported canal configuration of the maxillary first molar

Year	Author	Canal configuration		
		P	MB	DB
1979	Slowey	2 P	1 MB	1 DB
1979	Thews	2 P <sub>S,U</sub>	1 MB	1 DB
1982	Cecic	2 P <sub>S</sub>	2 MB <sub>S</sub>	1 DB
1983	Martinez-Berna	1 P	3 MB <sub>S</sub>	2 DB <sub>S,U</sub>
1984	Beatty	1 P	3 MB <sub>S</sub>	1 DB
1988	Bond	2 P <sub>J</sub>	2 MB <sub>S</sub>	2 DB <sub>J</sub>
1991	Wong	3 P <sub>S</sub>	1 MB	1 DB
1994	Jacobsen	2 P <sub>S</sub>	1 MB	1 DB
1997	Hulsmann	1 P	1 MB	2 DB <sub>S</sub>

S: separate canals with separate foramina.

J: Canals joining in the apical one-third.

The maxillary first molar most commonly has three or four canals, with one canal in both the palatal and distobuccal roots and one or two in the mesiobuccal root. The incidence of a mesiolingual canal has been reported between 18% and 96.1% (Hartwell and Bellizzi 1982, Kulild & Peters 1990). Cecic *et al.* (1982), Jacobsen & Nii (1994), and Stone & Stroner (1981) found cases of maxillary first molars in which the palatal canal contained one orifice, a bifurcated canal and two separate foramina. Beatty (1984) presented a case of a maxillary first molar with five canals, three of which were located in the mesiobuccal root. Bond *et al.* (1988) reported a case of a maxillary first molar with six canals: two canals with separate foramina in the mesiobuccal root, two canals with separate foramina in the distobuccal root, and two canals joining in the apical third of the palatal root. Hulsmann (1997) presented a maxillary first molar with two distinct canals in the distobuccal root. Slowey (1979) showed a case of a maxillary molar with two palatal canals and separate foramina. Martinez-Berna & Ruiz-Badanelli (1983) reported three cases of maxillary first molars with six canals: three canals in the mesiobuccal root, two in the distobuccal root and one in the palatal root and finally, Wong (1991) reported a case in which the palatal root had a single canal orifice, a trifurcation in the apical third and three separate foramina. This information is summarized in Table 1.

The present case report describes a case of a maxillary first molar with a canal configuration not yet reported in the literature. This tooth had a trifurcation in the palatal canal in the apical third with three separate foramina, two distinct canals in the mesiobuccal root and a single canal in the distobuccal root.

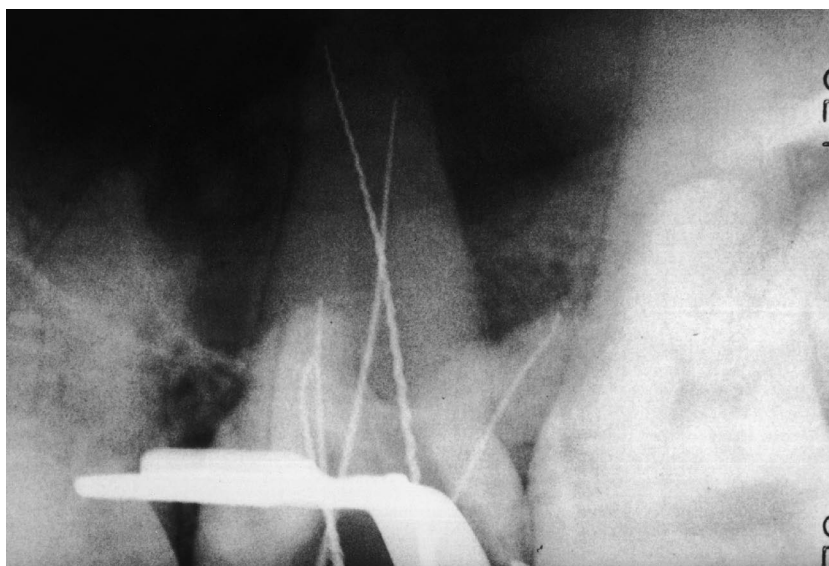
### Case report

A 19-year-old African-American male presented to the Emergency Clinic of the University of Pennsylvania, School of Dental Medicine, with the chief complaint of a toothache in his left maxilla. Due to deep decay in tooth #14 a diagnosis of symptomatic irreversible pulpitis with a normal periapex was made (Fig. 1). The patient's medical history was non-contributory and an emergency pulpectomy was performed at the first visit. During examination with an operating microscope (JedMed/Kaps, St Louis, MO, USA) the anatomy of the first maxillary left molar was determined as follows: two canals in the mesiobuccal root, one canal in the distobuccal root and a large palatal canal bifurcating approximately 4 mm from the working length with two separate foramina (Fig. 2). These five canals were instrumented and medicated with Ca(OH)<sub>2</sub>. At the third visit all canals were filled by a modified Microseal™ technique (Analytic Endodontics, Orange, California, USA) and with zinc-oxide-eugenol

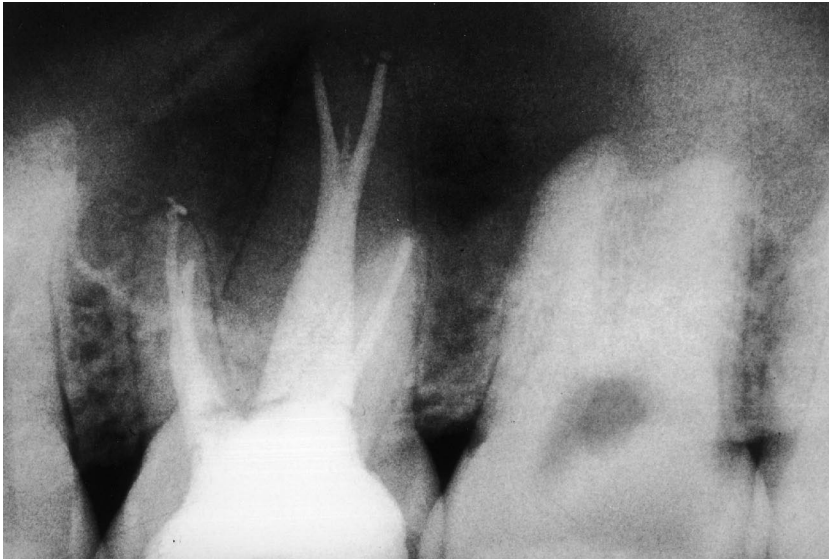


**Figure 1** Preoperative radiograph.

cement (Grossman type). The final obturation showed some of the obturation material flowing in an additional canal located between the two bifurcating palatal canals (Fig. 3). Doubt about the long-term success of the case was raised and it was decided to re-enter the palatal canal to evaluate the possible third apical branch. The gutta-percha was removed from the palatal canal up to the bifurcation level using a System B tip (Analytic Endodontics). This area was carefully inspected again under the operating microscope at high

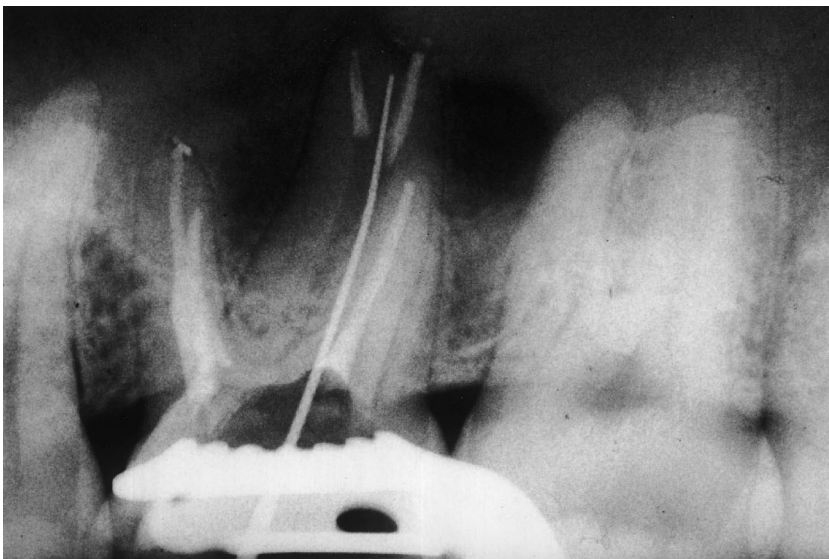


**Figure 2** Working length determination of five canals.



**Figure 3** Obturation of five canals. Note obturation material flowing between the two bifurcating palatal canals.

magnification (16–25 $\times$ ). This examination of the palatal root revealed the two canals filled with gutta-percha and between them, in a more buccal position, a third canal orifice. Under the microscope it was possible to insert a size 15 K-file and the existence of a third foramen was confirmed using an electronic apex locator (Root ZX, J. Morita MFG. Corporation, Kyoto, Japan). A new radiograph was taken with a size 20 K-file in place (Fig. 4). The radiograph clearly showed the presence of a third palatal canal. This canal was instrumented



**Figure 4** Working length determination of the sixth canal.



**Figure 5** Postoperative X-ray showing six separate canals with six separate foramina.

and filled using the modified Microseal technique (Analytic Endodontics). A temporary restoration with IRM was placed and a permanent restoration was advised. The post-operative radiograph showed six separate canals and six separate foramina of the tooth (Fig. 5). Twenty months later the patient was recalled for a follow-up. At the clinical examination the tooth was asymptomatic and the radiographic examination revealed normal periapical tissue (Fig. 6). However, the tooth had not yet been permanently restored



**Figure 6** A total of 20 months follow-up. The radiograph shows the integrity of the root canal therapy and a normal periapex.

at this recall visit and the patient was again instructed to return to his dentist for the restoration.

### Discussion

This article presents a case of a maxillary first molar with an unusual number and arrangement of canals. Usually, the interpretation of the radiograph along with a careful inspection of the pulp chamber floor by probing and by proper visualization allows the operator to understand the root canal configuration. In the present case, it was possible, based on radiographic interpretation, to visualize the bifurcated palatal canal. It was only after the first postoperative radiograph that a possible third palatal canal was suspected. The use of the operating microscope and the electronic apex locator were crucial both for the detection and for the management of the three canals in the palatal root.

### Conclusion

This case provides evidence that palatal roots in maxillary first molars can contain three separate canals.

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